

Appl. No. 09/742,229
Nortel Docket Number 11958ROUS01U
Attorney Docket No. 123-005

Remarks

Claims 36, 38, 39, 42, 43, 59 and 60 are amended. Claims 37, 45, 48 and 58 have been canceled. Claims 36, 38-44, 46-47, 49-57 and 59-61 are currently pending. Reconsideration and re-examination of this application is respectfully requested in view of the above amendments and below remarks.

Rejections under 35 U.S.C. §112

Claim 48 was rejected to under 35 U.S.C. §112, second paragraph, for being indefinite and failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 48 has been canceled, without prejudice or disclaimer, by way of this amendment.

Rejections under 35 U.S.C. §102

Claim 36 was rejected under 35 U.S.C. §102(e) as being anticipated by Merchant *et al.* (U.S. Patent Number 6,081,523).

Merchant:

Merchant describes, in the Abstract:

"A Gigabit network node having a media access controller outputting packet data at Gigabit rates uses multiple 100 MB/s media interface links coupled to a physical interface to enable implementation of a Gigabit network using low cost data links. A modified reconciliation layer, also referred to as a media interface, receives a data packet from a Gigabit MAC and divides the received data packet into multiple data segments having a prescribed length. The multiple segments are output on the multiple media interface links according to a prescribed output protocol..."

At column 6, lines 5-8, Merchant describes an exemplary output protocol:

"... FIG. 3A illustrates an output protocol where the media interface controller 36 simultaneously transmits a first contiguous group of segments to the respective MIIs (and subsequently the respective media interface links) according to a predetermined link order..."

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At col. 6, lines 60-63, Merchant describe "an alternate output protocol, where the MII control 36 outputs each successive segment of a first contiguous group of segments onto a corresponding physical layer link at predetermined intervals following the previous segment...."

Merchant thus describes both a round-robin output protocol, wherein multiple segments are output on multiple media interface links, and an alternate output protocol wherein groups of segments are selected for output on a link at predetermined time intervals. In either instance, segments are output using a FIFO storage sequence (column 5, lines 5-15), and thus are released in the order in which they are received.

Claim 36 was rejected under 35 U.S.C. §102(e) as being anticipated by Merchant *et al.* (U.S. Patent Number 6,081,523). Claim 37 was rejected to as being unpatentable over Merchant *et al.* in view of Irwin *et al.* (U.S. Patent Number 5,841,771). Applicant has amended claim 36 to include the limitations of claim 37, and cancelled claim 37. Thus the remarks below will also address the combination of Irwin and Merchant.

Applicant's claim 36, as amended, now recites "...At a source node, a method of data switching comprising ... receiving data segments, each of said data segments belonging to a data stream from among a plurality of data streams ... writing said each of said data segments in a payload memory device ... selecting a particular data stream from among said data streams for transmission by said source node, *the particular data stream selected according to a bit-rate allocation to each of the data streams*; and ... if there is at least one data segment in said payload memory device belonging to said particular data stream ... assigning to said particular data stream a current output channel from among a plurality of output channels, said current output channel *being selected to provide equitable distribution of said particular data stream across the plurality of output channels*, enqueueing a selected data segment belonging to said particular data stream in a buffer associated with said current output channel; and transmitting said selected data segment over said current output channel.

The Examiner states, on page 3, item 5, of the Office Action:

"Regarding claim 36, Merchant discloses "... selecting a particular data stream..." at col. 4, lines 25-35 and col. 7 lines 25-30. However, It is respectfully submitted that the present application claims a method and apparatus for transmitting data segments belonging

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to multiple data streams according to bit-rate allocation over a shared a multi-channel link while Merchant describes a method and apparatus for transmitting a single data stream transmitted over multiple channels 22 (Figure 1 in Merchant) in FIFO order. Because there is only one data stream in Merchant, the process of evenly assigning data segments among the multiple channels 22 is merely a FIFO; a straightforward passive round-robin process that does not require buffering data except for formatting purposes (e.g., parallel-to-serial conversion) and other rudimentary processes. For at least the reason that Merchant fails to disclose all of the limitations of claim 36, the rejection is overcome and should be withdrawn.

Claims 37-51

Claims 37, 38 and 42-51 were rejected under 35 U.S.C. §103(a) as being unpatentable over Merchant in view of Irwin. Claim 36 now includes a limitation from cancelled claim 37.

Irwin:

Irwin describes an apparatus and method for performing timeslot switching within a cell based transport and switching structure, where data signals appearing in an input transmission path are passed to an output transmission path with a portion of the data signals being switched in order of appearance by a time slot switch. The Examiner states, at page 8 of the office action: "Merchant does not explicitly state including wherein said step of selection said particular data stream is based on a bit-rate allocation In an analogous art, Irwin discloses selection of data streams based on bit rate allocation..."

It is known that in order to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The Examiner has failed to meet this burden with the combination of Merchant and Irwin.

1. No motivation for modification is provided

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The Examiner has did not provide any reason at all as to why one of skill in the art would be motivated to modify Merchant to include teachings of Irwin. Because no reason was provided, the rejection is improper and should be withdrawn.

2. Combination neither describes nor suggests the claimed invention

Assuming that a motivation for modifying the references as suggested by the Examiner could be found, the combination still would neither describe nor suggest the limitations of the claimed invention, as the cited references do not deal with equitable distribution of *multiple data streams among multiple channels*, as recited in the claims. Rather Irwin describes, in the abstract:

"... A switch module for time switching telecommunications data includes an input circuit for selecting data samples from a time slot in an input frame of data samples. The selected data samples are arranged into groups of uniform size, each group consisting of at least two data samples. The groups of selected data samples are stored in an orderly manner, in each of as many storage entities as there are data samples in each group. Thereafter in accordance with a predefined sequence peculiar to each of the storage entities, the data samples are simultaneously read out, group by group. An output circuit selects data samples into a selected group of data samples from among each of the readouts of each of the storage entities and transmits each selected group into an output frame of data samples..."

For at least the reason that the combination of Merchant and Irwin fail to disclose or suggest the claimed invention, claim 36 is patentable over the combination of Merchant and Irwin.

Claims 38 - 42 serve to further patentable limitations to claim 36 and thus are allowable with claim 36, although further discussion regarding their patentability may be found below.

Independent claim 43 recites "...a payload memory device for storing data segments received from said plurality of input ports, each of said data segments associated with one of a plurality of predefined data streams ... a first memory device logically partitioned into primary queues each of said primary queues associated with one of said predefined data streams and holding addresses in said payload memory of data segments belonging to said one of said predefined data streams ... a second memory device logically partitioned into secondary queues, each of said secondary queues associated with an output port from among said plurality of output ports ... a first controller for regulating transfer of selected addresses from each of said primary queues to said second memory device; and a second controller for

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equitably distributing said selected addresses from each of said primary queues among selected secondary queues...”

Such structure is neither shown nor suggested by the combination of Irwin and Merchant, in particular “a first controller for regulating transfer of *selected addresses* from each of the primary queues to said secondary memory device, and a second controller for equitably distributing said selected addresses from each of said primary queues among selected secondary queues...”

The Examiner states, at page 9 of the office action “it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the plurality of input ports of Irwin into the system of Merchant to allow for receiving and buffering cells from a multiplicity of sources for subsequent orderly transport to their destination ports...”

Applicant respectfully points out that the “Virtual Gigabit Layer” (FIG. 2 in Merchant) includes a transmit buffer 34 and a receive buffer 44. There is no mention of any facility for sorting data units, or addresses of data units. There is no mention of any memory device partitioned into queues in Merchant. The purpose of the second memory device in the present application is to hold data-memory addresses of data segments belonging to different data streams which may compete for a given output channel in a multi-channel link. Such a memory would not be needed in the system of Merchant which considers all data segments offered to channels 22 (FIG. 1 in Merchant) of a multi-channel link to belong to a single data stream. In the system of Merchant, consecutive data segments are transmitted over consecutive channels 22 without any interference because there is only one data stream.

Applicant further points out that, in the system of Merchant, a first controller for regulating transfer of selected addresses from primary queues to a second memory device cannot possibly exist because, as the Examiner correctly indicated on page 9, lines 9-13, of the office action, Merchant does not explicitly state having a first memory device logically partitioned into primary queues. Applicant further asserts that the purpose of the primary queues in the present application is to sort data segments according to the data streams to which they belong. There is no need for such a sorting process in the system of Merchant which considers only a single data stream per multi-channel link.

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Accordingly, for at least the additional reasons that the combination of references fails to disclose or suggest the invention, it is respectfully requested that the rejection be withdrawn. Claims 44 and 46-51 depend upon claim 43, serve to add further patentable limitations to claim 43, and are allowable for at least the reasons put forth with regard to claim 3.

Claims 39-41 were rejected under 35 U.S.C. §103(a) as being unpatentable over Merchant in view of Rochberger *et al.* (U.S. Patent Number 6,577,653).

Rochberger:

Rochberger describes, at column 9:

"...When the source requests a call with a bandwidth greater than 155 Mbps, the bandwidth of two or more of the paths are aggregated together to form a virtual single link matching the requested bandwidth. The source edge node 14 performs multiple route calculations to find a sufficient number of paths to fulfill the bandwidth request. Once the paths are found, hardware in the source edge node 14 and the destination edge node 18 performs the serial to parallel and the parallel to serial conversions. The setup and operation of the multiple VCC route is transparent to the source end station 12 and the destination end station 20..."

The Examiner states, at page 7 of the office action:

"... Merchant does not explicitly state wherein said current output channel has a logical relationship... In an analogous art, Rochberger discloses an apparatus for establishing a route utilizing multiple parallel segments where a particular data stream is broken up into segments and transmitted in a round robin fashion between all parallel paths. (Rochberger, col. 12, line 54 through col. 13 line 3). Because, transmission is performed in a round-robin fashion, the current output channel depends on the previous output channel. Therefore it would have been obvious to one in the ordinary skill in the art to combine Merchant's arrangement for transmitting packet data segments with Rochberger to establish a connection between a source and destination node using multiple parallel paths, where bandwidth capacity on the multiple paths are aggregated and combined to form a route having a bandwidth larger than any single path (Rochberger, col. 6 lines 55-67).

Applicant respectfully submits that the combination of references still fails to disclose several limitations of the claimed invention. For example, although both Merchant and Rochberger describe round-robin transmission of data segments, the combination of

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references fails to disclose the selection methods of the present invention, which are recited in the claims as including "... the particular data stream selected according to a bit-rate allocation to each of the data streams; and if there is at least one data segment in said payload memory device belonging to said particular data stream ... assigning to said particular data stream a current output channel from among a plurality of output channels, said current output channel being selected to provide equitable distribution of said particular data stream across the plurality of output channels ..."

Accordingly, for at least the reason that the combination of references fails to describe or suggest the limitations of the claimed invention, the rejection of claims 39-41 is overcome and should be withdrawn.

Claims 52-55 and 57

Claims 52-55 were rejected under 35 U.S.C. §102(e) as being anticipated by Rotolo *et al.* (U.S. Patent Number 6,542,268).

Rotolo:

Rotolo describes, in the abstract, "An optical cross-connect for the switching of optical channels at variable bit-rate (up to 10 Gbit/s), wavelength division multiplexed on bi-directional optical fibers forming the transmission backbone of a transport network; in particular the cross-connect can be interfaced to fibers crossing the nodes of a ring having large territorial extension, provided with protection fibers..."

The Examiner states, on page 4, item 6, of the Office Action that Rotolo discloses the network described in claim 52 of the present application. Applicant respectfully disagrees.

Claim 52 recites 'a plurality of source nodes... a plurality of cross connectors... a plurality of core nodes ... a second plurality of cross connectors ... a plurality of sink nodes... and a plurality of multi-channel links connecting said source nodes to said first plurality of cross connectors, said first plurality of cross connectors to said core nodes, said core nodes to said plurality of cross connectors, and said plurality of cross connectors to said sink nodes ... wherein said first plurality of cross connectors is configurable to provide

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multi-channel paths from each of said source nodes to at least one of said core nodes; and wherein each of said source nodes sends data streams to at least one of said sink nodes and regulates the bit rate of each of said data streams; and wherein each of said source nodes divides data of each of said data streams equitably among channels of a selected multi-channel path..."

The Examiner uses various elements depicted in Figs 9a and 9b of Rotolo as equivalents to the claimed elements. However, the elements proffered as equivalent are not equivalent in function or design.

Reference is made to Col. 9, lines 24-35, in Rotolo:

"A further object of the invention is to indicate an optical cross-connect architecture that supports flexible protection schemes, and other requirements to tailor the node characteristics to different contexts it might operate into.

To attain said objects, scope of the present invention is an optical channel cross-connect connected to N optical input fibers and at least a same number of output fibers, the same being crossed by relevant signals obtained from the multiplexing of M component flows transmitted at different wavelengths, and each n -th entering fiber being connected to an $N \times M$ ways n -th input optical splitter, said $N \times M$ ways being connected to n -th inputs of a set of $N \times M$ input optical selectors having N inputs and one output, ..."

Applicant points out that the term 'cross connector' (often termed 'cross connect') is used in the art to denote a coarse switch having a plurality of input ports and a plurality of output ports. A cross connector switches large blocks of data or entire wavelength channels. As such, a cross connector is an active switching device and not a passive transmission connector as the name may imply. Applicant points out that there are numerous known designs of optical cross connectors and Rotolo discloses a specific design of an optical cross connector that is based on the well-known technique of 'Broadcast-and-Select'. Broadcasting of an input optical signal is realized by splitting the input optical signal into a plurality of identical optical signals, each of which is a replica of the input optical signal. In the cross connector of FIGS. 9a and 9b in Rotolo there are four input fiber links and four output fiber links. Each fiber link carries eight 'optical flows' each optical flow corresponding to a wavelength channel from among eight wavelength channels.

It would appear from the Examiner's reference to Rotolo, col. 9, lines 25-35, that the

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Examiner equates source nodes of the present application with the input WDM stage of Rotolo, FIG. 9a. Applicant further points out that FIG. 9a and FIG. 9b *together* represent an optical cross connector having four input fiber links and four output fibers with each fiber link, input or output, carrying eight wavelength channels (each wavelength channel carrying an optical flow). However, neither FIG. 9a nor FIG. 9b includes individual cross connectors. FIG. 9a includes the following components, none of which bearing any resemblance to a cross connector: input fibers {IN₁, IN₂, IN₃, IN₄}, four amplifiers {OFAR1, OFAR2, OFAR3, OFAR4}, four optical splitters {S_{IN,1}, S_{IN,2}, S_{IN,3}, S_{IN,4}}, 32 optical selectors {X_{IN,1,1}, X_{IN,2,1}, ..., X_{IN,3,8}, X_{IN,4,8}}, and 32 filters {F_{1,1}, F_{2,1}, ..., F_{3,8}, F_{4,8}}.

Apparently, the Examiner equates the fiber lines, connecting the broadband splitters {S_{IN,1}, S_{IN,1}, S_{IN,1}, S_{IN,1}} to the optical selectors {X_{IN,1,1}, X_{IN,2,1}, ..., X_{IN,3,8}, X_{IN,4,8}} (optical interconnections), to cross connectors 330 or 350 of the present application. Applicant respectfully points out that the optical interconnection fibers are passive intra-device transmission lines while a cross-connector is an active switching device. Such elements are not equivalent to the elements claimed in the present invention.

Apparently, the Examiner equates the filters {F_{1,1}, F_{2,1}, ..., F_{3,8}, F_{4,8}} in Rotolo to core node 240/940 (FIG. 2 and FIG. 9 of the present application). A core node, as described in the specification of the present application, has a plurality of multiple-channels input links and multiple channels output links, and performs a switching function where any input wavelength channel in any input multi-channel link may be directed to any output multi-channel link. A filter in Rotolo has one input fiber and one output wavelength channel and does not perform any switching function because there is only one output. Such elements are not equivalent to the elements claimed in the present invention.

On page 4, item 6, of the office action, the Examiner states that Rotolo discloses a second plurality of cross connectors (Rotolo, col. 9, lines 25-35, FIG. 9b, Optical interconnections). Applicant respectfully points out that the optical interconnections in FIG. 9b in Rotolo are passive transmission links and cannot function as cross connectors.

On pages 4 and 5, item 6, of the office action, the Examiner states that Rotolo discloses a plurality of multi-channel links connecting said source nodes to said first plurality

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of cross connectors (Rotolo, FIG. 9a, 1.1, 2.1), said first plurality of cross connectors to said core nodes (Rotolo, FIG. 9a, $X_{in1.1}$), said core nodes to said second plurality of cross connectors (Rotolo, FIG. 9b, $S_{out1.1}$), and said second plurality of cross connectors to said sink nodes (Rotolo, FIG. 9b, X_{out}):". Applicant respectfully points out that $X_{in1.1}$ is an optical selector and $S_{out1.1}$ is an optical splitter, neither of which functions as a core node 240 or a cross connector 330/350 of the present application.

On page 5, item 7, of the office action, the Examiner equates the parallel-plane optical cross connectors (FIG. 10 of the present application) to the 1:2 / 2:1 ADD-DROP multiplexer of FIG. 13a in Rotolo. Applicant respectfully points out that there are no structural or functional resemblance between a parallel-plane cross connector and an ADD-Drop multiplexer as described by Rotolo.

On page 5, item 8, of the office action, the Examiner states that Rotolo discloses the limitations of claim 53 of the present application, including a second plurality of cross connectors configurable to provide multi-channel paths from each core node to at least one sink node. Reference is made to Rotolo, FIG. 9b, $X_{out1.1}$. Applicant respectfully points out that FIG. 9b includes 32 bridge units whose function is selectable on a per-channel basis (such as transit, insertion, dropping, or regeneration), 32 optical splitters $\{S_{out1.1}$ to $S_{out4.8}\}$, 32 optical selectors $\{X_{out1.1}$ to $X_{out4.8}\}$. Neither an optical splitter nor an optical selector functions as a cross connector.

On page 6, item 9, of the office action, the Examiner states that Rotolo discloses the limitations, substantially as described in claim 52, including at least one multi-channel link directly connecting at least one of said source nodes to at least one of said core nodes, thereby bypassing said first plurality of cross connectors. The Examiner refers to FIG. 9 in Rotolo and states that Rotolo teaches a multi-channel link from $S_{out1.1}$ directly connected to $X_{out1.1}$.

Applicant points out that claim 55 refers to a direct connection from a source node to a core node, bypassing cross connectors. On page 4, item 6, of the office action, the Examiner had already equated the source nodes of the present application to the "input WDM stage" of FIG. 9a. The input WDM stage of FIG. 9a includes fiber links and optical amplifiers as clearly indicated in Rotolo, FIG. 9a. Based on the equivalence set forth by the Examiner, a

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direct link from a source node to a core node, as described in claim 55 of the present application, has to emanate from the input WDM stage and not from optical splitter $S_{out1,1}$.

On page 6, item 10, the Examiner states that Rotolo discloses the limitations, substantially as described in claim 53, including the limitation that at least one of the switch planes includes an optical switch. Reference is made to Rotolo, col. 20, lines 55-60.

Applicant respectfully points out that the referenced passage (Rotolo, Col. 20, lines 55-60) describes aspects on an ADD-DROP multiplexer and has utterly nothing to do with multiple switch planes.

In order to support a rejection under 35 U.S.C. §102, *every* limitation in the claims must be shown or suggested in the cited reference. Because Rotolo fails to meet this burden for the several reasons discussed above, it is respectfully submitted that the rejection of claims 52-55 and 57 over Rotolo be withdrawn.

Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rotolo in view of Grow (U.S. Patent 6,629,147).

On page 12, item 22, of the office action, the Examiner states that "Rotolo discloses the limitations, substantially as claimed, as claimed in claim 53. However, Rotolo does not explicitly state wherein each of said planes has its own scheduler for scheduling transfer of data across each of said switch planes."

As discussed earlier, Applicant respectfully points out that there are no parallel switch planes in the system of Rotolo; the entire device depicted in FIG. 9a and FIG. 9B represents a single switch plane analogous to switch plane 950 of FIG. 9 in the present application. It is also respectfully submitted that Grow discloses a single-plane switch and, therefore, the deployment of multiple schedulers, one scheduler per switching plane, is not applicable. Accordingly, for at least the reason that the combination of references fails to disclose or suggest the limitations of the claimed invention, it is respectfully requested that the rejection be withdrawn.

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Claims 58 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grow in view of Aicklen (U.S. Patent Application 2003/0067653).

Claim 58 has been canceled, without prejudice or disclaimer, by way of this amendment. Claim 59 has been amended to depend directly from amended claim 60.

Allowable Subject Matter

Applicant thanks the Examiner for the indication that claims 60 and 61 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicant amended claim 60 to include all the limitations of base claim 58. Claim 61 depends directly from claim 60, believed to be allowable.

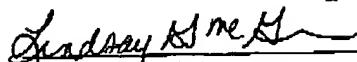
Conclusion

Applicant has made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Lindsay G. McGuinness, Applicant's Attorney at 978-264-6664 extension 304 so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

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